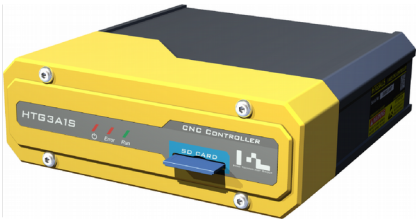
CNC Mill/VMC Controller

User Manual



v2

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HIND TECHNOLOGY GROUP

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1 Introduction

1.1 Overview

Computer Numerical Control (CNC) is one in which the functions and motions of a machine tool are controlled by means of a prepared program containing coded alphanumeric data. CNC can control the motions of the work piece or tool, the input parameters such as feed, depth of cut, speed and functions such as turning spindle on/off, turning coolant on/off.

HTG CNC Controller link to CNC Controller to motor drivers supporting step/direction control. They are compatible with most of drives to control motion of motors. HTG CNC Controller uses USB port to take input from keyboard and a VGA output to display on screen.

HTG controller provides complete Hardware/Software Solution. Additional machine control is not required. The HTG CNC Controller is a dedicated application, designed to fully exploit the features of the purpose-built hardware. It has many advanced features to assist day-to-day CNC machine operation.

1.2 Warnings and Caution Information

WARNING: Indicates circumstances or practices that can lead to personal injury as well as to damage to the control, the machine, or other equipment.

CAUTION: Indicates circumstances or practices that can lead to damage to the control or other equipment.

1.3 Software features

- Machine and job status visualisation in real-time
- Easy user interface
- Keyboard rapid and jogging

1.4 Hardware features

- Repetitive Job Feature
- USB Keyboard Support
- VGA interface for standard LCD screens
- Dedicated system requiring no PC interface
- SD Card support for loading G-code
- Program Start, Stop and Resume functionality
- Can be interfaced to standard Servo/Stepper drives and motors
- RS-232 pot for expandability
- Isolated inputs
- Systems health and power monitoring system
- Fly by Wire/Dual MPG pendant support
- Output for flood, Mist and Lubrication
- Light tower control
- 5 isolated auxiliary inputs
- 5 auxiliary outputs
- 2 Analog inputs
- Standard MPG dial support

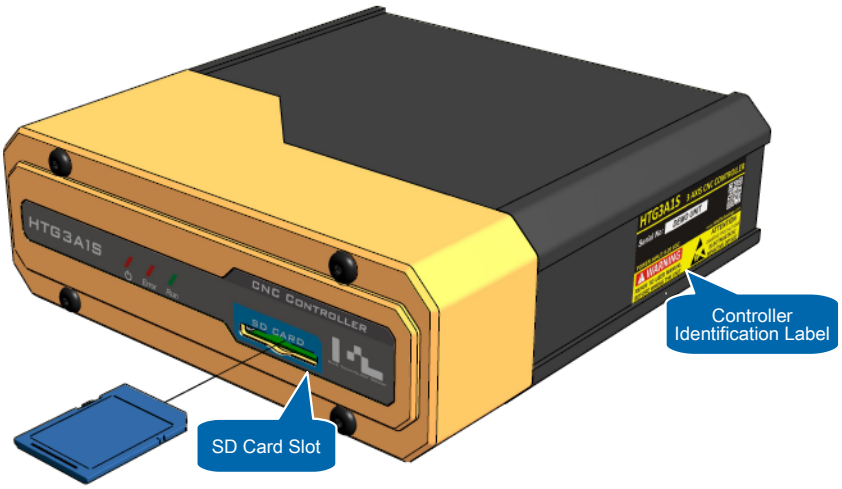
2 System Overview

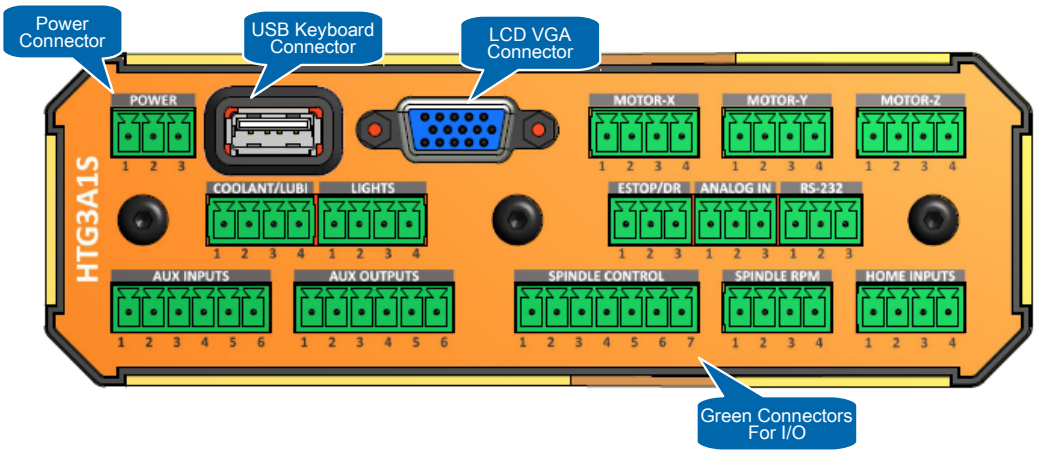
2.1 Overview

This chapter describes how to operate the HTG CNC Controllers.

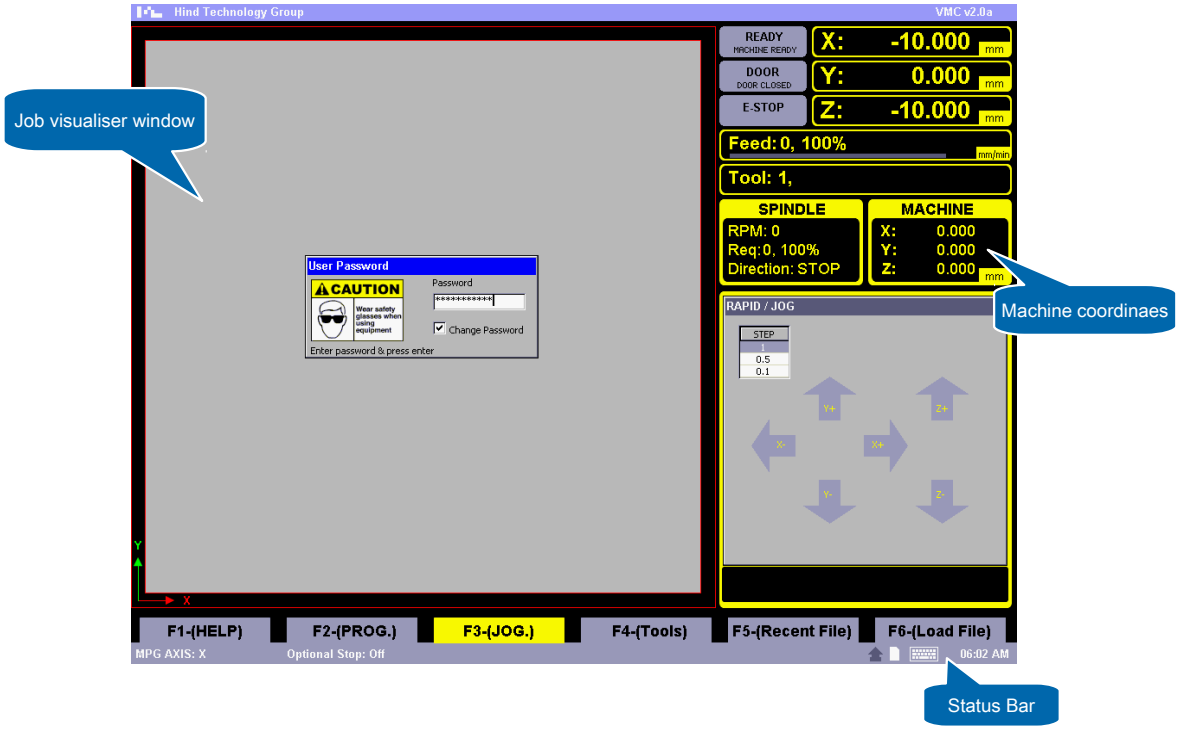
2.2 System Layout

2.2.1 Controller Layout

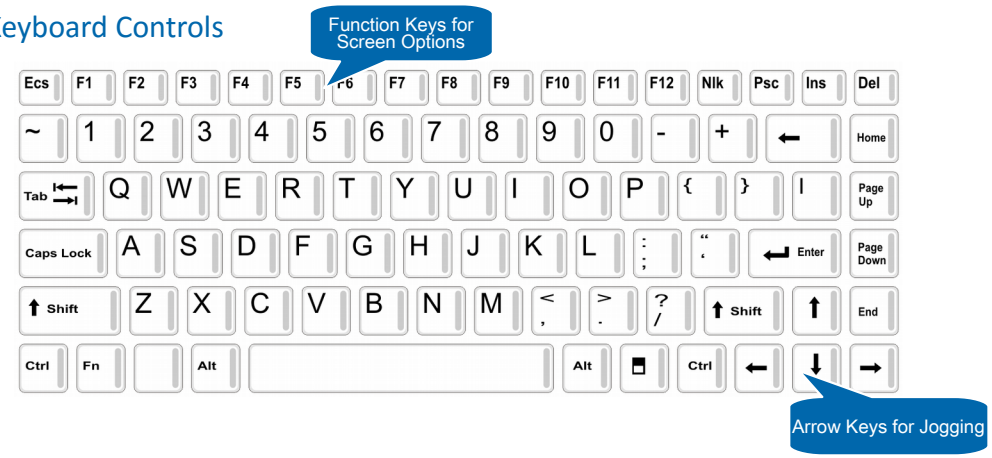




2.2.2 User Interface Layout



2.2.3 Keyboard Controls



2.3 Power Procedures

2.3.1 Power On Precautions

1. Visually check to make sure that the control and the machine are in normal operating conditions.
2. Power **ON** the machine.
3. If characters are not displayed on the screen within 30 seconds, press
4. the power **OFF** button immediately.

2.3.2 Power OFF Precautions

1. Before you turn the power off, make sure that the control is in **STOP**.
2. Press the **E-Stop** button.
3. Make sure that power is turned off to all peripheral devices (tape reader, tape punch, etc.) that are connected to the control.
4. Press the power **OFF** button.

WARNING: To prevent damage to the machine, never turn off power while a part program is being executed. Before turning off power, make sure that the control is in STOP.

2.4 Control Conditions for Powering On

After powering up the system, the system resets a number of initial operating conditions as listed below:

- The system is placed in E-Stop. The system is not allowed to come out of E-Stop and the user is alerted to reset E-Stop and then home the machine before being able to use the machine.
- The system defaults to the following after power up:
  - Default plane selection
  - Default machine units, mm or inches
  - Coordinate system is reset to absolute
  - Job offsets are reset
  - Default feed rate

2.5 Emergency Stop (E-Stop) operations

To use this feature Press the red E-Stop button or any other E-Stop switches installed on the machine to stop operations regardless of the condition of the control and the machine.

Pressing the E-Stop Button will result in the following:

- E-Stop Button will start blink on screen alerting that E-Stop is activated.
- The machine tower light and controller “Error” LED light on the front panel will start blinking indicating that the control has gone into lock state.
- All axis motors are disabled immediately.
- Spindle is put in brake position through VFD.

Note: If E-Stop button is pressed while a part program is running, program execution will halt and the machine can only be used after a fulling homing cycle.

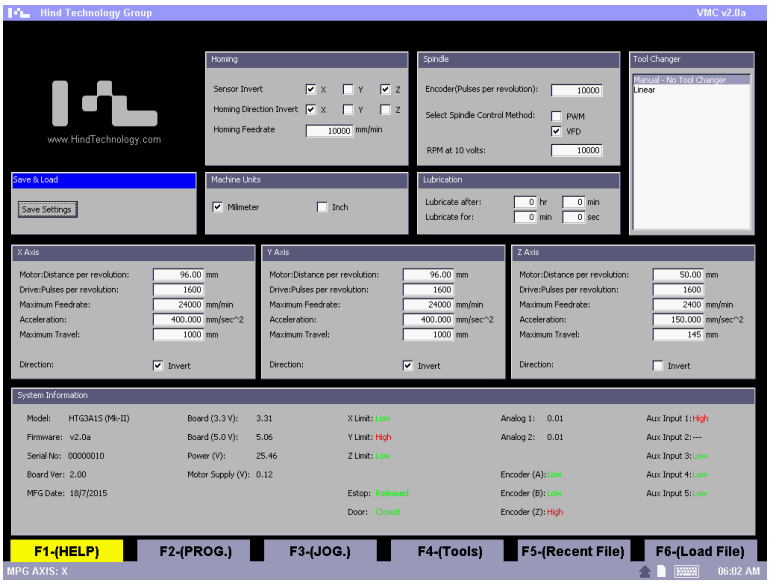
Emergency Stop Reset:

- Before resetting the emergency stop state, first locate and eliminate the cause of the emergency stop.
- If the E-Stop button is locked in the pressed position, it must be released before the emergency stop state can be reset.
- Next the user can use the Rapid/Jog features to move the machine axis.
- Once its safe to home the machine, press CTRL + ATL + HOME to home the machine.
- ***NOTE: The machine can only be used after a fulling homing cycle.***

3 Graphical Interface

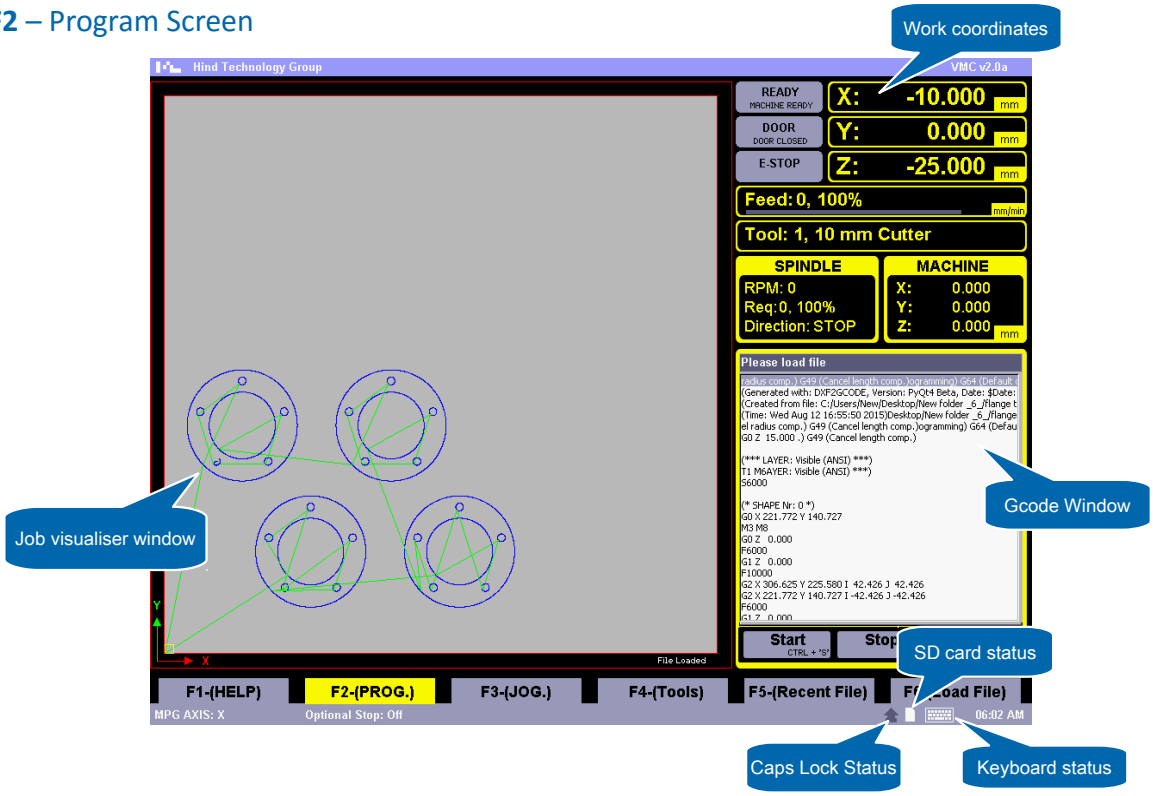
The user interface is divided into 6 screens and the screens can be selected using function keys F1 to F6.

3.1 **F1** – Help and Setup Screen



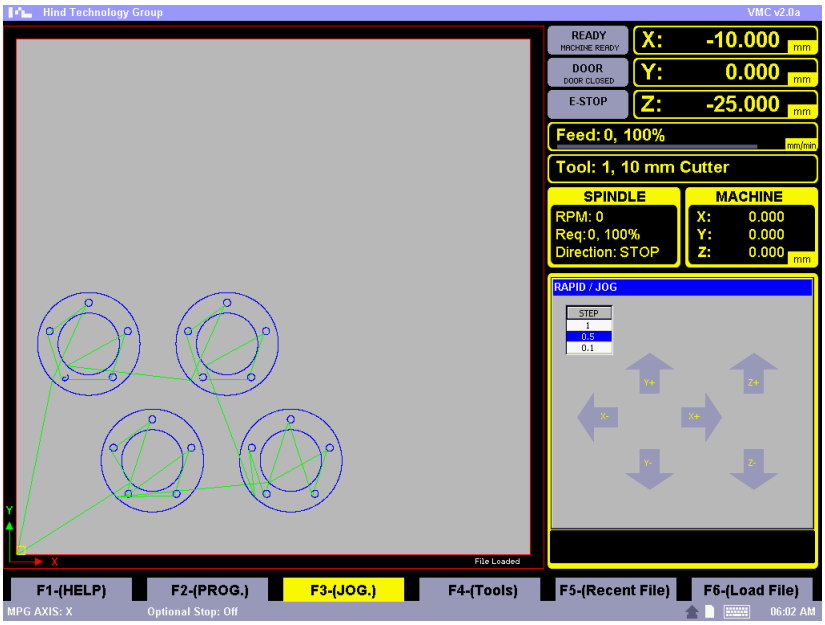
The ***"F1 - Help"*** Screen displays current machine status and all vital information such as controller and external power supplies status.

3.2 **F2** – Program Screen



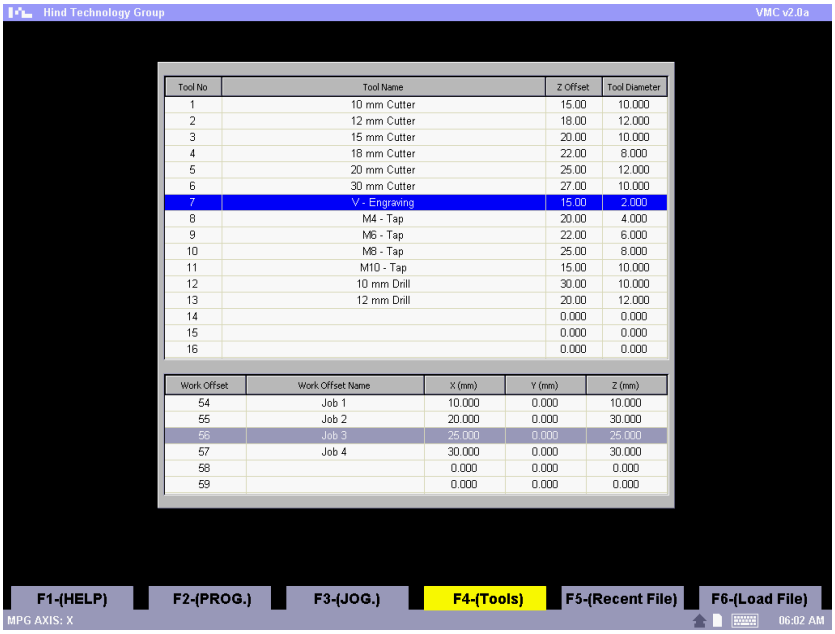
The ***"F2 - Program"*** Screen is the main screen where all the G-code related functions are located.

3.3 **F3 –** Jog/Rapid Screen



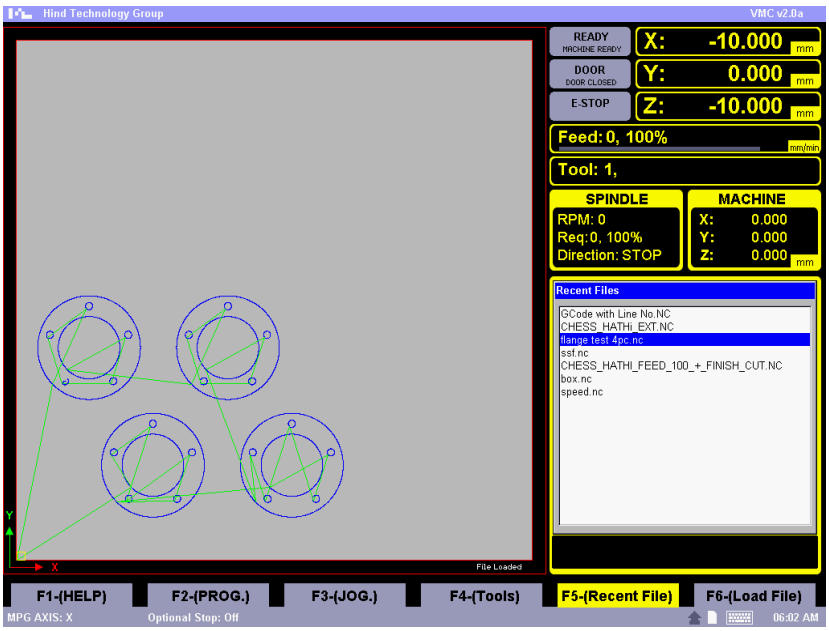
The ***"F3 – Jog/Rapid"*** Screen is used for manual control of axis for job and tool offsetting purposes.

3.4 **F4 –** Tools Table Screen



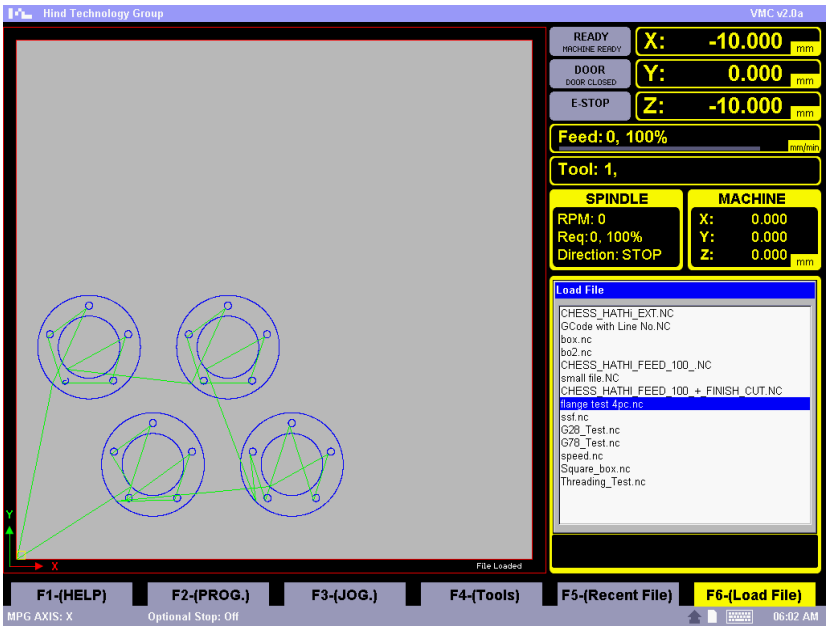
The ***"F4 – Tools"*** Screen is used for setting the calibrating and managing tools and Work offset tables

3.5 **F5 –** Recent Files Screen



The ***"F5 – Recent Files"*** Screen is used for loading recently used G-code files.

3.6 **F6 –** Load Files Screen



The ***"F6 – Load Files"*** Screen is used for loading G-code files from SD Card.

4 Setting up the system

4.1 Default system password

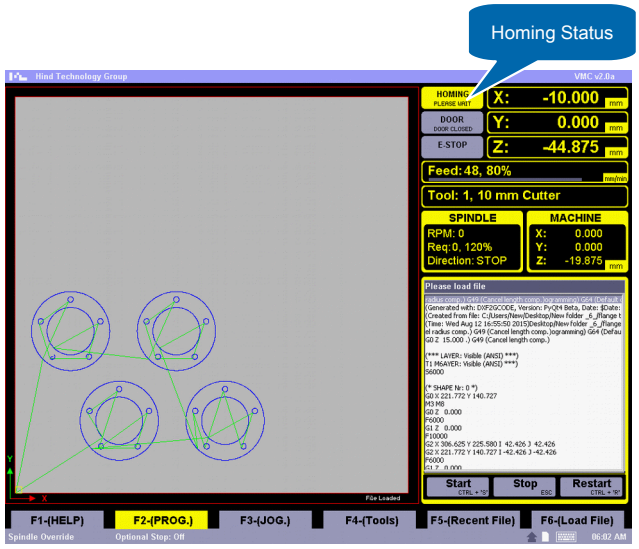
By default the system password is set to HTG in capital letters for both Admin and User logins.

4.2 Setting System Time

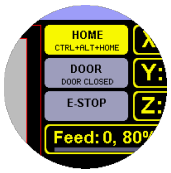
- Press ***"F2"*** to goto the ***"F2 - Program"*** screen
- Next press ***CTRL + M*** to open the MDI Window
- For example to set system time to 10:30 AM, type Time:10:30 and press the ***Enter*** key
- **NOTE: The time must be entered in 24 hour format and no spaces between characters**

5 Manual & MDI Operations

5.1 Homing



Press “CTRL+ALT+HOME” to home the machine



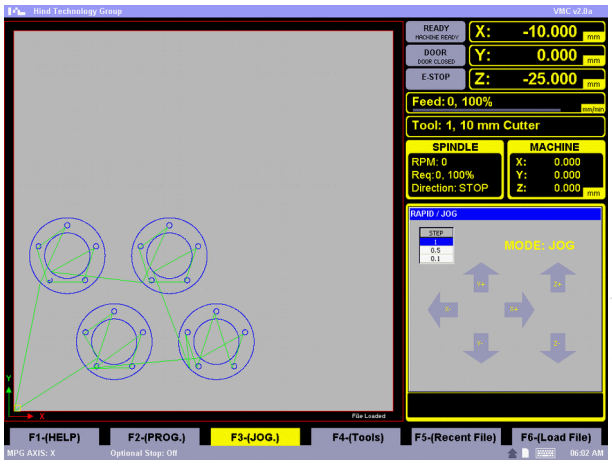
The system is not homed, press CTRL + ALT + HOME to start the homing sequence

Machine is homing, please wait while homing finishes. Press Escape key to abort homing

System homed successfully and machine ready

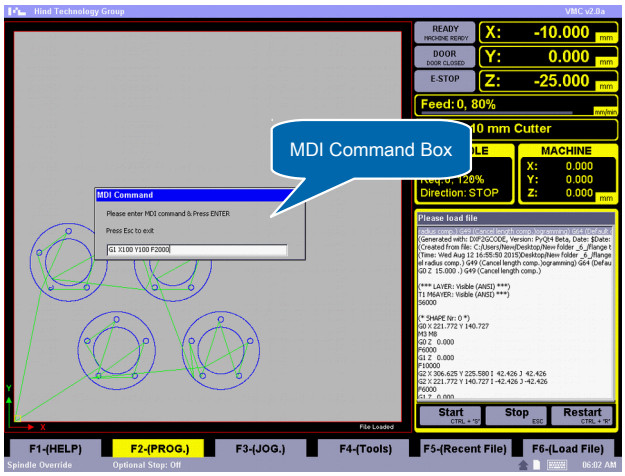
Homing error, this might be caused due to bad homing switches or cables

5.2 Rapid / Jog



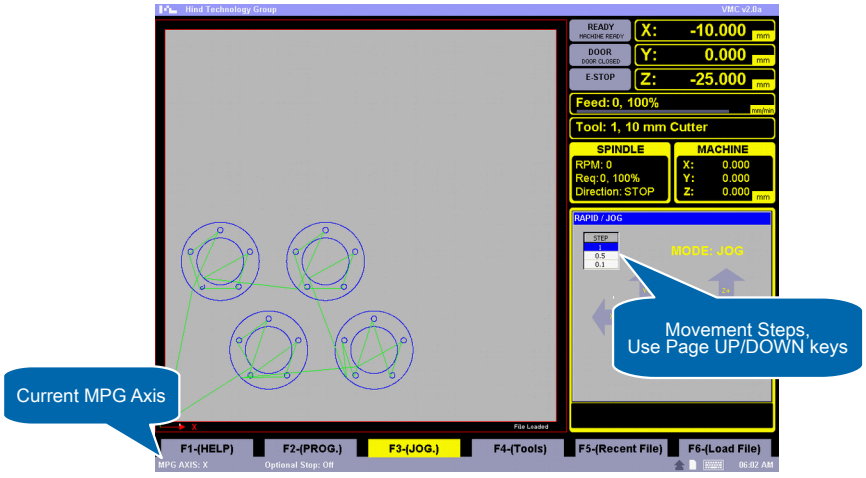
Press “F-3” to goto “Jog/Rapid” screen

5.3 MDI Operations



Press “CTRL+M” to enter MDI command

5.4 Using MPG (Manual Pulse Generator)

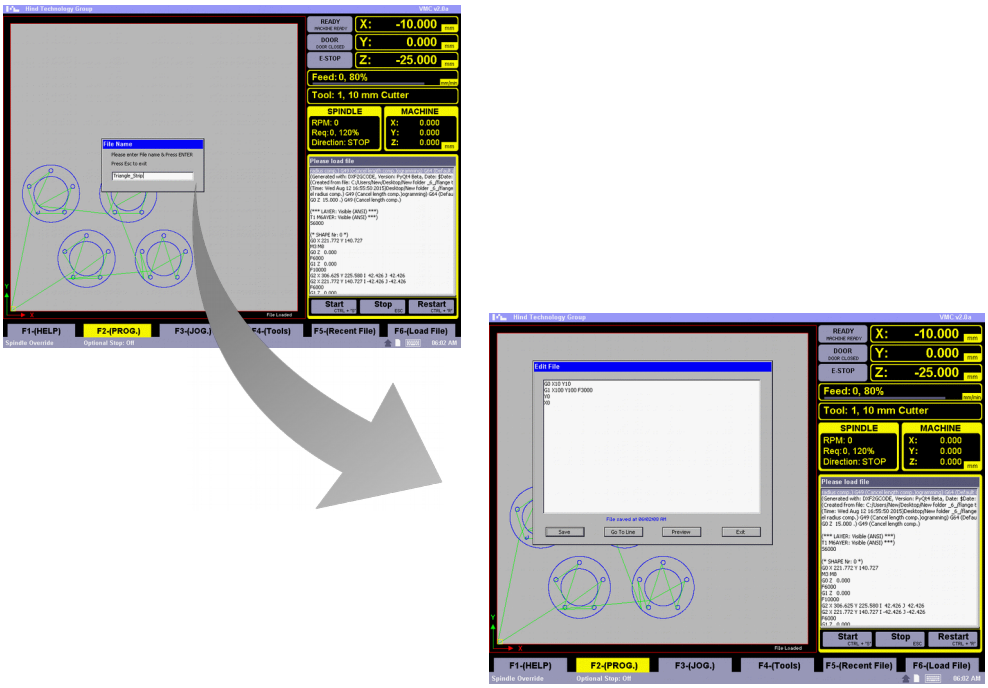


- Press ***“F3”*** to goto the ***“F3- Jog”*** screen
- In this screen the MPG dial will be active and turning the dial will move the currently selected Axis
- To change the Jog/Dial movement steps the Page **UP** and Page **DOWN** keys can be used
- To change Axis for MPG motion press the **X** or **Y** or **Z** keys

6 G-Code Operations

6.1 Creating New G-Code Files

- Press ***"F2"*** to goto the ***"F2 - Program"*** screen
- Next press ***CTRL + N*** to open a new file name window
- Enter the file name and press the ***ENTER*** key to open the file edit window



6.2 Editing G-Code

- Press ***"F2"*** to goto the ***"F2 - Program"*** screen
- Next press ***CTRL + E*** to open the edit file window

6.3 Supported G-Codes

G-Code	Description
G00	Rapid Move
G01	Linear interpolation
G02	Circular interpolation (Clockwise)
G03	Circular interpolation (Counter Clockwise)
G04	Dwell
G10	Set Coordinate System
G17	X Y plane selection
G18	Z X plane selection
G19	Y Z plane selection
G20	Set machine units to Inches
G21	Set machine units to Millimetres
G90	Set distance mode to absolute
G91	Set distance mode to incremental

6.4 Supported M-Codes

M-Code	Description
M00	Program stop
M01	Optional program stop
M02	Program end
M03	Spindle on clockwise
M04	Spindle on counter clockwise
M05	Spindle off
M07	Coolant on
M08	Coolant 2/mist on
M09	Coolant off
M10	Chuck or rotary table clamp on
M11	Chuck or rotary table clamp off
M28	Return to origin

7 Loading & Running G-code Programs

7.1 Loading Files from SD Card

7.1.1 Load File Menu

1. Press ***"F6"*** to goto the ***"F6 - Load File"*** screen.
2. Next from the list of files displayed, using the ***UP*** and ***DOWN*** arrow keys select the file.
3. Press ***ENTER*** and the file preview will be displayed in the visualiser window.
4. Pressing enter again will load the file for machining and the screen will automatically change to ***"F2 - Program"***.

7.1.2 Recent Files Menu

1. Press ***"F5"*** to goto the ***"F5 - Recent File"*** screen.
2. Next from the list of files displayed, using the ***UP*** and ***DOWN*** arrow keys select the file.
3. Press ***ENTER*** and the file preview will be displayed in the visualiser window.
1. Pressing enter again will load the file for machining and the screen will automatically change to ***"F2 - Program"***.

7.2 Running G-code programs

1. Programs can only be run from the ***"F2 – Program"*** *screen,* Press ***"F2"*** to goto the ***"F2 - Program"*** screen if already not in the ***"F2 – Program"*** *screen.*
2. Press ***"CTRL + S"*** to start the program.

7.3 Stopping Program (Feed Hold)

1. Pressing the ***"Escape Key"*** will stop the program and put the system in ***Feed Hold*** mode.

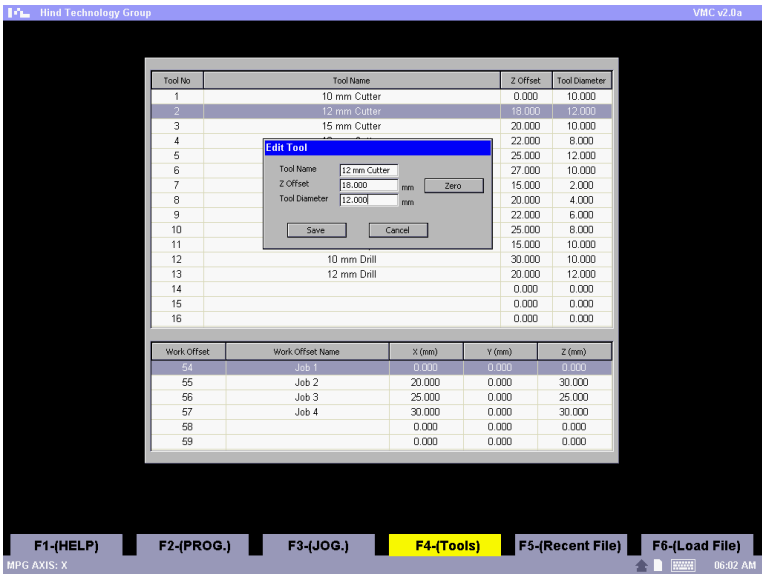
7.4 Resuming Program

1. Programs can only be resumed from the ***"F2 – Program"*** *screen,* Press ***"F2"*** to goto the ***"F2 - Program"*** screen if already not in the ***"F2 – Program"*** *screen.*
1. *Press* ***"CTRL + S"*** *to start the program.*

7.5 Restarting Program from Start

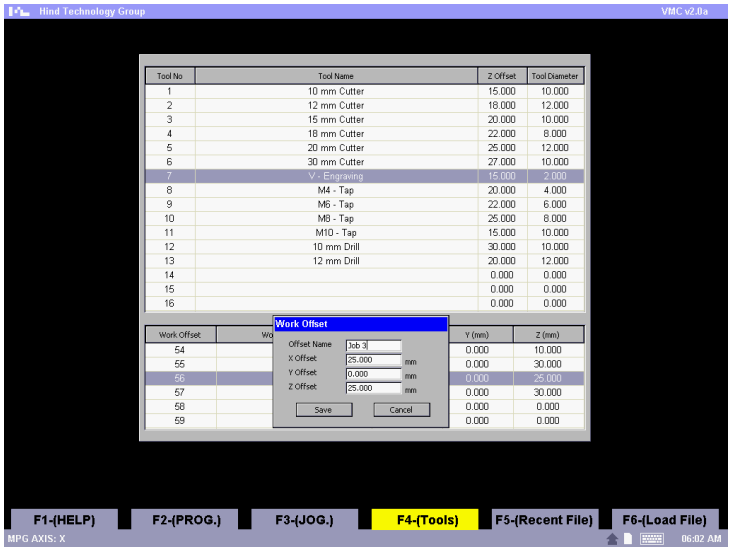
1. If you require to restart the Program from staring, Press ***"CTRL + R"***.
2. Press ***"CTRL + S"*** to start the program.

8 Managing Tools



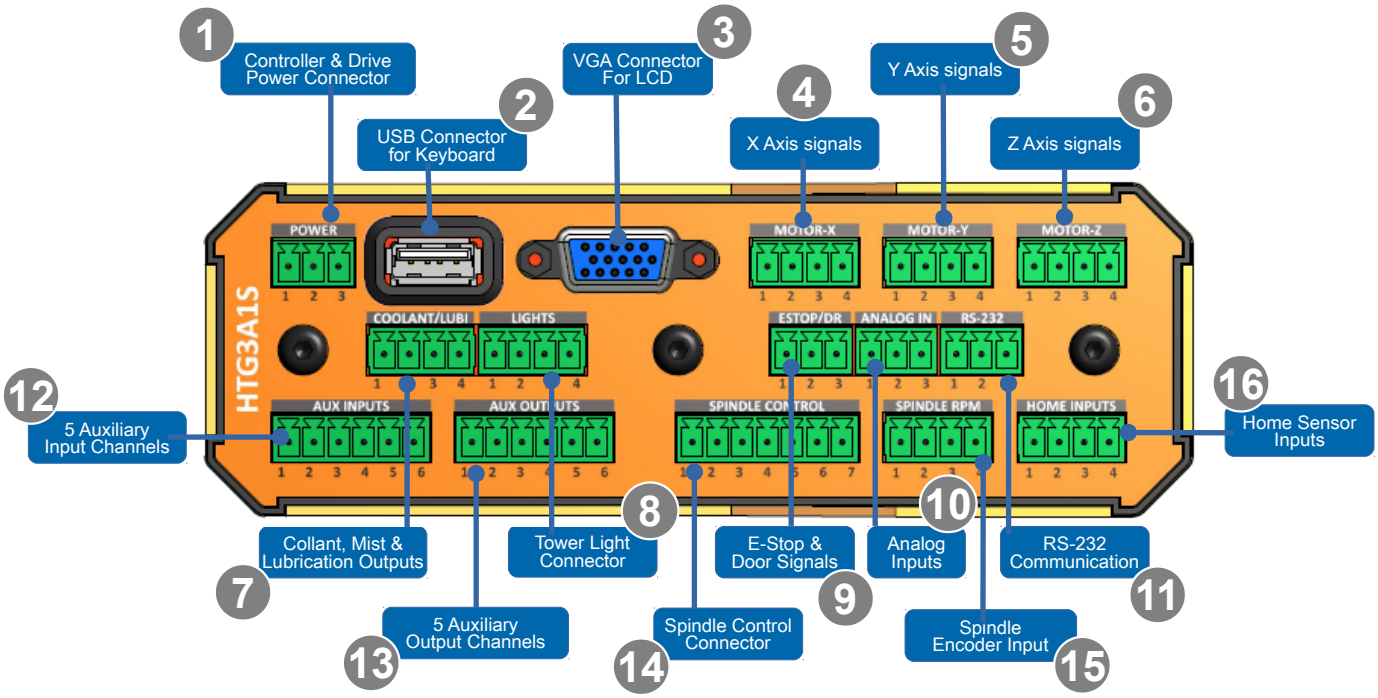
1. Tools and tool offsets can be managed by using the **F4-Tools** screen
2. User can switch between Tools and Works offset windows using the **TAB** key
3. Select the tool using the **UP / DOWN** arrow keys and press **ENTER** to open tool edit window
4. Tool names can be given for reference and all offset/calibration values can be entered in this window

9 Managing Work Offsets



1. Work offsets can be managed by using the **F4-Tools** screen
2. User can switch between Tools and Works offset windows using the **TAB** key
3. Select the Work offset using the **UP / DOWN** arrow keys and press **ENTER** to open work offset edit window
4. Work offset names can be given for reference and all offset values can be entered in this window

10 Hardware Connections

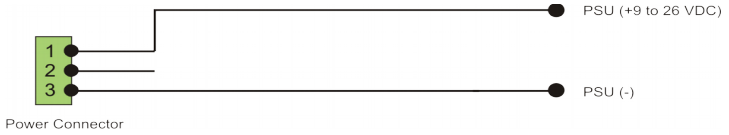


Rear view of the controller showing connectors

10.1 Power Connector

1

Pin No.	Description
Pin1	Controller power (9 to 26 VDC)
Pin2	Motor Power Supply input for monitoring by the controller
Pin3	GND



Wiring example using SMPS

10.2 VGA Connector

2 A standard 15 pin female VGA connector is used to connect to an external LCD monitor.

10.3 USB Connector

3 Standard USB connector for connecting a USB keyboard/Numpad to the system.

10.4 Servo/Stepper Motor Connectors for X, Y & Z Axis

4

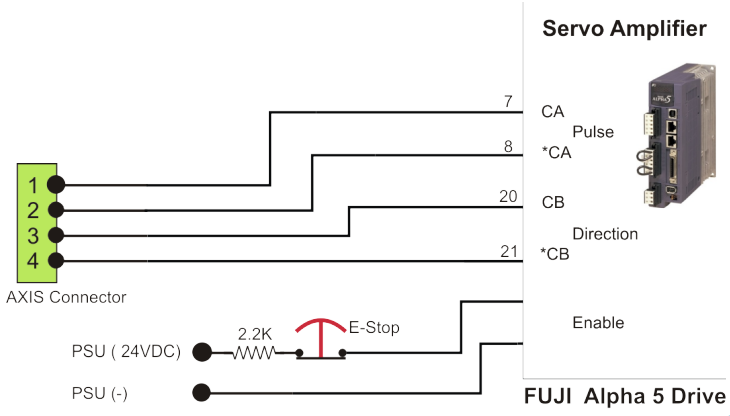
Pin No.	Description	Type
Pin1	X – Pulse(+)	Differential Signal (-5 to +5v)
Pin2	X – Pulse(-)	Differential Signal (-5 to +5v)
Pin3	X – Direction(+)	Differential Signal (-5 to +5v)
Pin4	X – Direction(-)	Differential Signal (-5 to +5v)

5

Pin No.	Description	Type
Pin1	Y – Pulse(+)	Differential Signal (-5 to +5v)
Pin2	Y – Pulse(-)	Differential Signal (-5 to +5v)
Pin3	Y – Direction(+)	Differential Signal (-5 to +5v)
Pin4	Y – Direction(-)	Differential Signal (-5 to +5v)

6

Pin No.	Description	Type
Pin1	Z – Pulse(+)	Differential Signal (-5 to +5v)
Pin2	Z – Pulse(-)	Differential Signal (-5 to +5v)
Pin3	Z – Direction(+)	Differential Signal (-5 to +5v)
Pin4	Z – Direction(-)	Differential Signal (-5 to +5v)

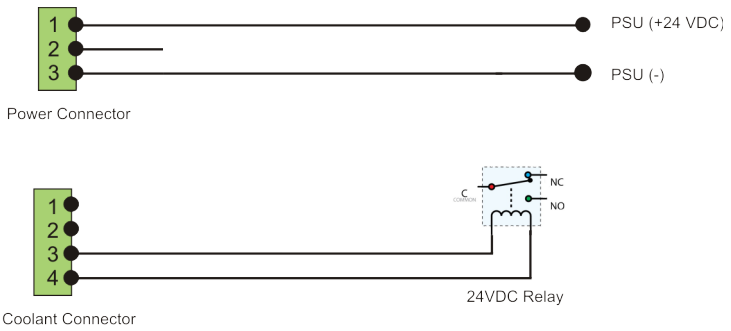


Wiring example using FUJI make Alpha 5 Drive

10.5 Coolant and Lubrication Connector

7

Pin No.	Description	Type
Pin1	Flood Coolant	Power Signal
Pin2	Mist Coolant	Power Signal
Pin3	Lubrication	Power Signal
Pin4	+ve power that is connected to the controller	Common +ve

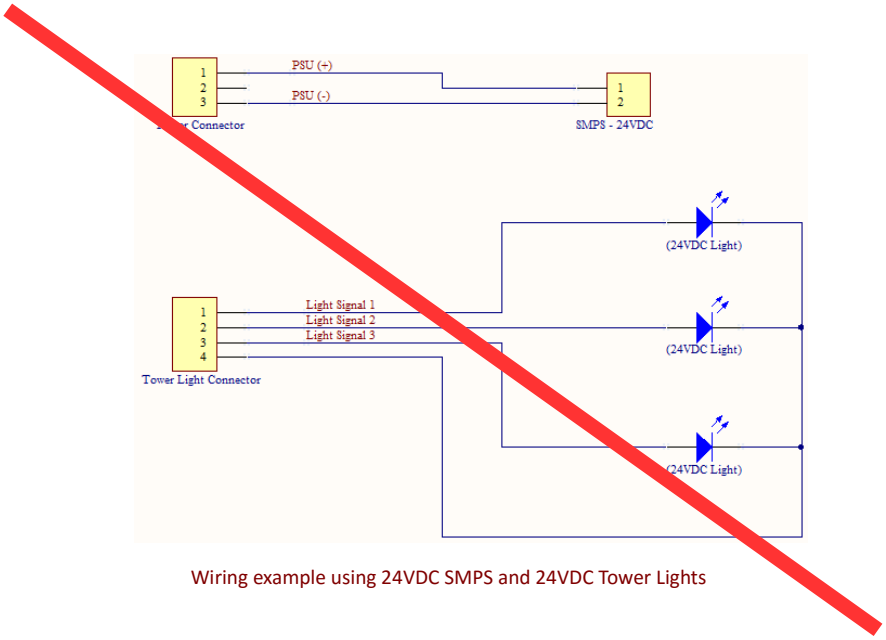


Wiring example using 24VDC SMPS and 24VDC Relays for Plasma ARC On/Off and Lubrication Pump On/Off

10.6 Tower Light Connector

8

Pin No.	Description
Pin1	Light Signal 1
Pin2	Light Signal 2
Pin3	Light Signal 3
Pin4	+ve power that is connected to the controller



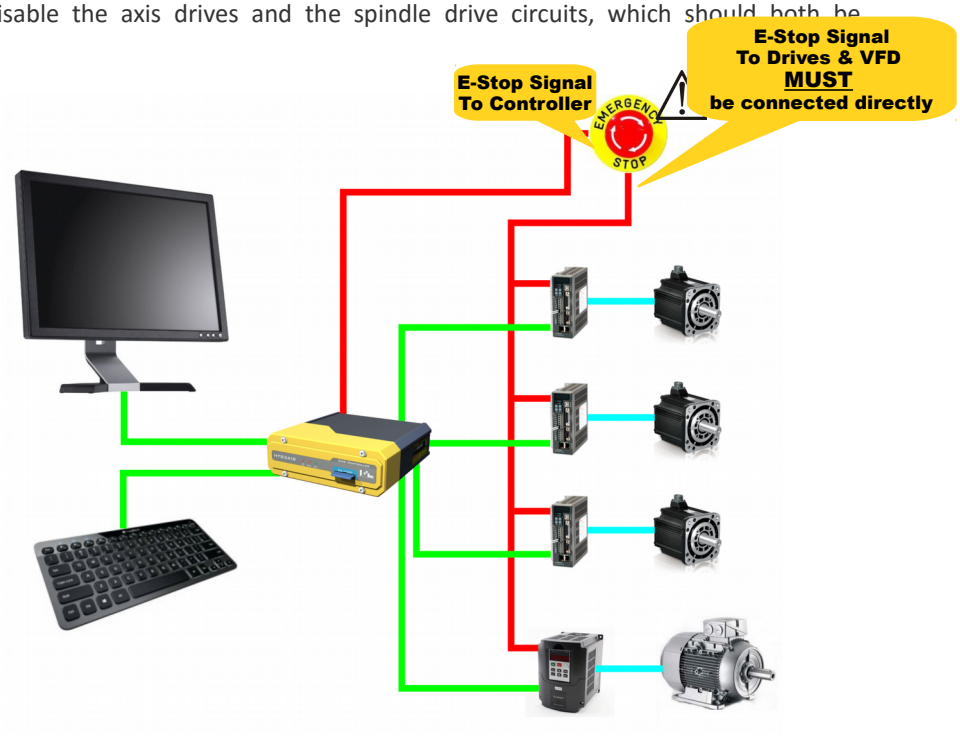
Wiring example using 24VDC SMPS and 24VDC Tower Lights

10.7 E-Stop and Guard Door Connector

9

Pin No.	Description
Pin1	E-Stop Signal
Pin2	Guard Door Signal
Pin3	GND - Isolated

WARNING: To avoid damage to equipment or hazard to personnel, the system installer should connect the E-Stop button, so that pressing the button opens the circuit connected to the E-STOP STATUS terminal on the control. This should disable the axis drives and the spindle drive circuits, which should both be connected to this terminal.



10.8 Analog Inputs

10

Pin No.	Description	Type
Pin1	Analog Input 1	0 to 5 Volts
Pin2	Analog Input 2	0 to 5 Volts
Pin3	GND	

10.9 RS 232 Connector

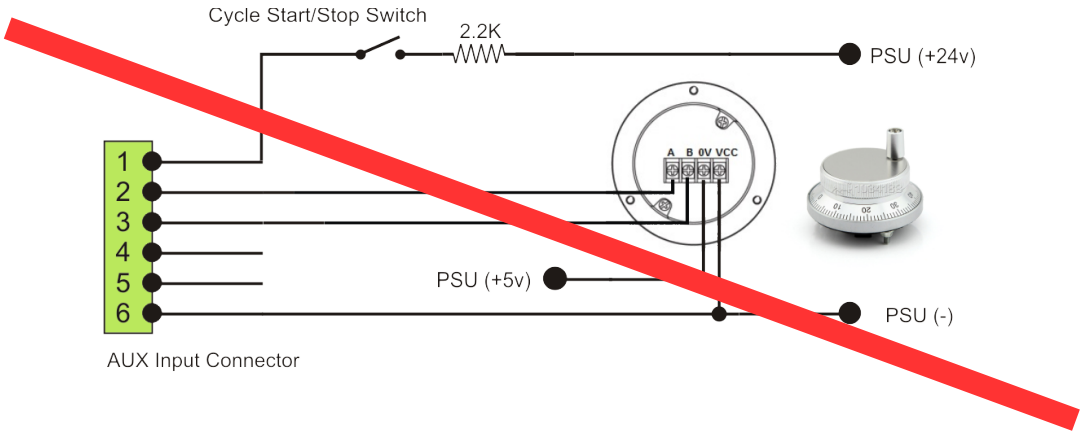
11

Pin No.	Description	Type
Pin1	RS-232 RXD	-12v to +12v
Pin2	RS-232 TXD	-12v to +12v
Pin3	Negative from Switch/Sensor - Isolated	Negative

10.10 Auxiliary Input / Fly by wire

12

Pin No.	Description	Type
Pin1	Auxiliary Input Signal 1	5 Volt Tolerant Signal
Pin2	Auxiliary Input Signal 2	5 Volt Tolerant Signal
Pin3	Auxiliary Input Signal 3 – MPG (A)	5 Volt Tolerant Signal
Pin4	Auxiliary Input Signal 4 – MPG (B)	5 Volt Tolerant Signal
Pin5	Auxiliary Input Signal 5	5 Volt Tolerant Signal
Pin6	Negative from Switch/Sensor - Isolated	Negative



10.11 Auxiliary Outputs

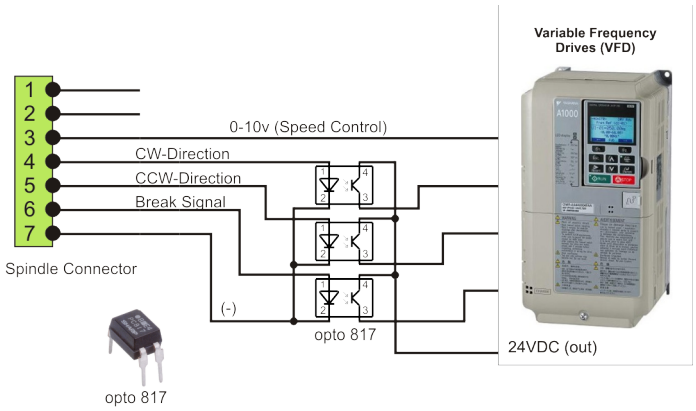
13

Pin No.	Description	Type
Pin1	Output Signal - Chuck or rotary table clamp	TTL 5 Volt
Pin2	Output Signal	TTL 5 Volt
Pin3	Output Signal	TTL 5 Volt
Pin4	Output Signal	TTL 5 Volt
Pin5	Output Signal	TTL 5 Volt
Pin6	GND	

10.12 Spindle Connector

14

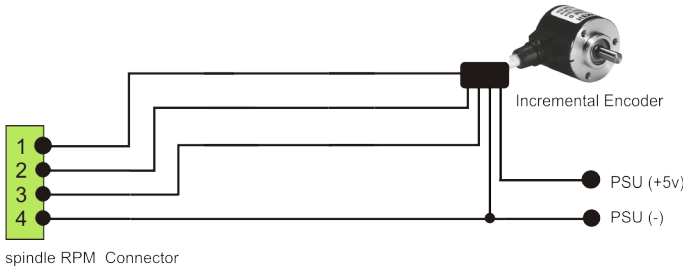
Pin No.	Description	Type
Pin1	Modbus Data (+)	
Pin2	Modbus Data (-)	
Pin3	0-10V DC	Analog
Pin4	Motor Direction Clockwise / PWM output	TTL 5 Volt
Pin5	Motor Direction Counter Clockwise	TTL 5 Volt
Pin6	Spindle Brake	TTL 5 Volt
Pin7	Negative	Negative



10.13 Spindle RPM Sensor

15

Pin No.	Description	Type
Pin1	Signal A	Opto input
Pin2	Signal B	Opto input
Pin3	Index	Opto input
Pin4	GND - Isolated	

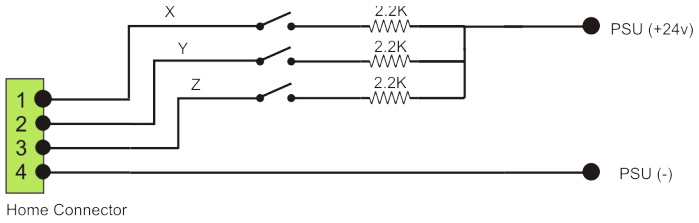


Wiring example showing a 5 volt Incremental Encoder wiring for spindle

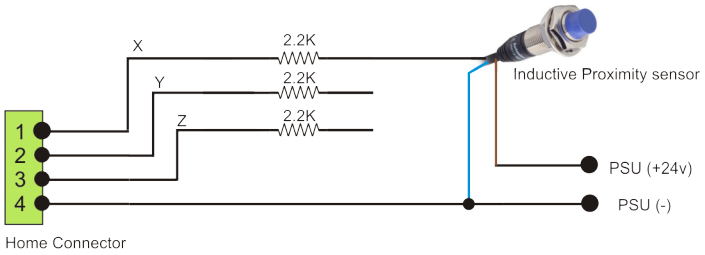
10.14 Home Input

16

Pin No.	Description	Type
Pin1	X Home	Opto input
Pin2	Y Home	Opto input
Pin3	Z Home	Opto input
Pin4	GND - Isolated	



Wiring example using switches with 24v power

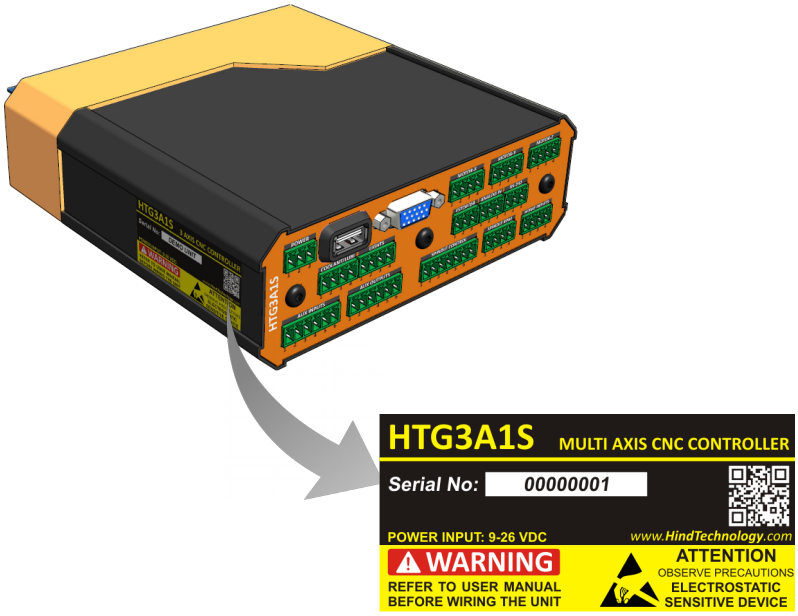


Wiring example using a 24v Inductive Proximity Sensor

11 Upgrading/Unlocking the controller

Regular updates are released to add more features to the units. Custom software's are also released for special client requirements. The software up-gradation process can be easily performed on site by following the instructions below:

- Check that the ***"Controller-xxxxxxxx.htg"*** file matches the serial number of the controller.



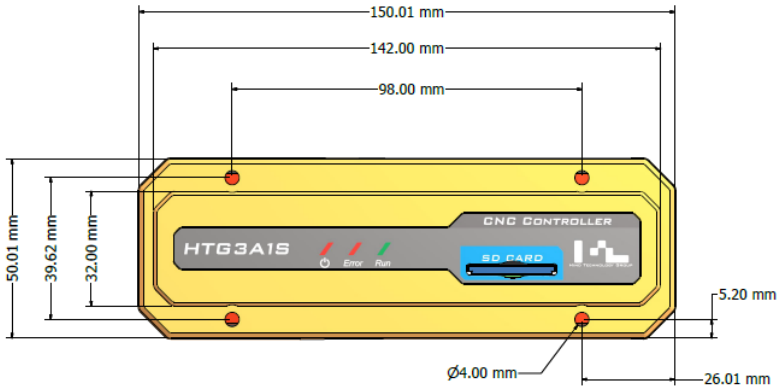
- Copy the ***"Controller-xxxxxxxx.htg"*** file to a SD card
- Power off the controller
- Insert the SD card into the controller
- Power up the controller and a message will be displayed on the screen showing the upgrade status
- Once the upgrade is finished please remove the SD Card and power cycle the unit

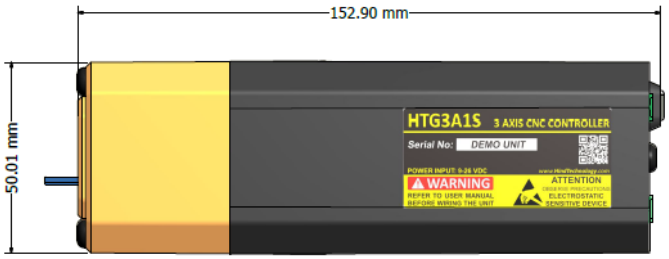
12 Detailed Specifications

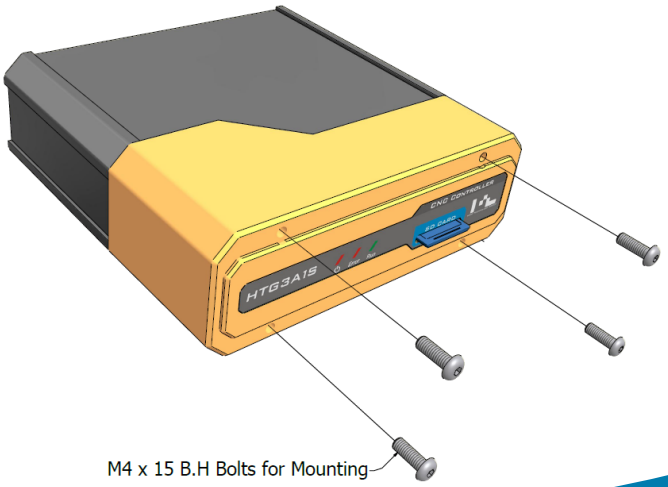
12.1 Electrical

- Input voltage: 9 - 26 VDC.

12.2 Mechanical data







13 Getting Support

Full support for our products is available and the users/clients can directly get in touch with our support staff by visiting www.hindtechnology.com or by emailing SUPPORT at support@hindtechnology.com

13.1.1 Reporting Bugs

If during operations the system behaves unexpected or any bugs are found then the user should email SUPPORT the following information so that we can have the issue resolved at the earliest:

1. Take a screenshot of the current screen by pressing the ***"Ctrl+Alt+Ptr Sc"*** keys on the keyboard. A message will be displayed on the screen notifying the user that the file has been saved to the SD Card.
2. Next email the above generated file to SUPPORT and a detailed description of the issue.
3. If the issue is related to a particular G-code then email the G-code file so that we can replicate the problem at our end.

14 Warranty

All units are warranted to be free from defects in workmanship and material, and are warranted to meet the Company's published specifications, but no other warranty, expressed or implied, is made by the seller unless expressly set forth. Hind Technology Group warrants its equipment for two (2) years to be free from defects in workmanship and material.

Hind Technology Group shall have no obligation or liability under this warranty:

- For special, indirect or consequential personal or property damage arising from the failure of its equipment.
- If the equipment was not installed, operated or maintained in accordance to Hind Technology Group's installation instructions.
- If the equipment was serviced, repaired, altered or modified in any way by a third party other than Hind Technology Group authorised personnel.

Hind Technology Group further reserves the right to the following:

- The right to repair or replace customers' units at its discretion.
- The right under this warranty to refuse or reject any and all warranty claims for any reason whatsoever if, based on the Company's estimation, damage to subject equipment was not caused by component or factory workmanship defects.

Any unit sent back to Hind Technology Group for warranty repair must have prior notification and approval for the return or the unit will be refused delivery.

All transportation costs, both in-bound and out-bound freight, are the responsibility of the customer.